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ABSTRACT

The purpose of the study was to determine the relative importance of: (1) generalized ability; (2) prior specific learning; (3) self concept; (4) peer esteem; and (5) teacher esteem for pupils on the prediction of arithmetic achievement. The study included proportional numbers of fifth grade students from four community classification strata (center city, suburban, rural farm and rural non-farm) and their teachers from 11 elementary schools. Pretest consisting of IQ tests, arithmetic achievement tests and sociometric paired comparison tests were administered. Similar post tests were administered five months later, excluding the IQ test. Teachers completed a sociometric paired comparison of each pupil's arithmetic performance. Four major conclusions are drawn: (1) achievement is positively correlated with status within the classroom, but achievement could be treated as a separate construct independent of status; (2) as a predictor of achievement IQ was more accurate than pretest achievement; (3) sociometric status variables did not improve accuracy of achievement prediction when IQ and achievement pretests were in the equation; and (4) there were no significant differences among the four types of communities with respect to prediction of achievement. (Author/MC)

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EFFECTS OF CLASSROOM SOCIOMETRIC STATUS ON ACHIEVEMENT PREDICTION

by

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Rationale

Rosenthal and Jacobson (1968) created considerable interest in the effect known as "self fulfilling prophecy" when they reported that elementary school children in an experimental study increased their intelligence quotient scores after their teachers had been told to expect them to "spurt" or to "bloom" in intelligence. Thorndike (1968) raised several questions concerning the results of Pygmalion based on his analysis of the reported test scores. Thorndike did not question the theory, but he did question the methodology which led to the general conclusion supporting the position of a general "self fulfilling prophecy" effect.

The position of "self fulfilling prophecy" exponents may be summarized as follows. If a teacher expects children to succeed, they will show greater signs of success than children not expected to succeed. While the theory of teacher expectancy as an effect is not new (Stagner, 1948), disproportionate emphasis on this effect tends to ignore other important classroom variables which may be equally or more important to the prediction of success in school.

Jensen (1969a, 1969b, 1969c) has created new interest in the effect of ability or intelligence on achievement. Although the relationship between ability tests and classroom achievement is clearly established, there has been wide spread disagreement about whether ability tests measure generalized achievement rather than true ability. At present this controversy seems to be caught in a circuitous trap.

Sociologists have long maintained that the performance of individuals within a group is dependent upon the sociometric status of the member within the group (Moreno, 1941; Cartwright and Zander, 1960). Research by Coopersmith (1959, 1968), Brandt (1968) and Caputo, Psathas and Plapp (1967) all reported that the self concept of an individual is positively related to his performance in a work group or classroom group of peers. Peer ratings of other individuals in a work group have also been shown to be positively related to performance within the group. Coleman (1966) commented on this effect as follows:

> A child's fellow students provide challenges to achievement and distractions from achievement; they also provide opportunities to learn outside the classroom, through association and casual discussions. (p. 183)

Success or failure in a classroom may be conceived as the aggregate effect of many variables acting in concert (Peper and Chansky, 1970). One of the major problems in predicting success or failure is determining the relative importance of prediction variables. It was the purpose of this study to determine the relative importance of (1) generalized ability, (2) prior specific learning, (3) self concept, (4) peer esteem, and (5) teacher esteem for pupils on the prediction of arithmetic achievement.

Since several ecological studies have established that pupil performance varies with community classification (Chansky, 1966) and that there are teacher differences (Gutherie, Penfield and Evans, 1969) associated with community classification, this study was also designed to include proportional numbers of pupils from four community classification strata. Also, differences in findings associated with community classification were examined.

Procedures

Sample Selection

Five hundred and one fifth grade pupils and their twenty-two teachers from eleven elementary schools participated in the study. The pupil sample was stratified according to population proportions in center city, suburban, rural farm and rural non-farm communities in the States of New Jersey and Pennsylvania. Class size was restricted to a minimum of twenty pupils and a maximum of thirty pupils, and the grouping for instruction was limited to self contained settings of pupils with mixed ability levels.

Test Administration

A pretest battery was administered to all pupils in this study in September of 1968. The pupil pretest consisted of an IQ test, an arithmetic achievement test, and a sociometric paired comparisons test. The teachers completed a sociometric paired comparisons estimate of each pupil's arithmetic performance. A similar posttest battery was administered in February of 1969 with one exception. The IQ test was not administered on the posttest. During the five month interval between tests, communication between the researcher and the school personnel was limited to administrative correspondence only. The purpose was to avoid any treatment effect by providing feedback on any of the variables.

The following specific test data were analyzed:

1. Individual IQ scores from The California Test of Mental Maturity - Short Form.

2. Grade equivalent scores from The Arithmetic Problem Solving Test of The Iowa Tests of Basic Skills.

3. Transformed self and peer proportions from a sociometric questionnaire for pupils which asks each pupil to compare his arithmetic problem solving ability with every other pupil in the class. This was done by marking "above me" or "below me" columns beside each pupil's name on the list.

4. Transformed proportions for each pupil from a Sociometric Questionnaire booklet for teachers which was designed to permit teachers to compare the arithmetic problem solving ability of each pupil with every other pupil in the room.

Data Analysis

Arithmetic prediction. A multiple regression equation was computed using the arithmetic posttest score as the criterion. IQ scores, pretest and posttest self esteem, pretest and posttest peer esteem, pretest and posttest teacher esteem for pupils, and pretest arithmetic were used as prediction variables. Each variable was tested for significance of contribution to the equation using analysis of variance for multiple regression. (Edwards, 1965)

Differences between regression coefficients of communities were also analyzed by analysis of variance techniques for regression coefficients. (Wert, Neidt and Ahman, 1965)

A principal components factor analysis was conducted using the intervariable correlation matrix for total sample as input data for the problem.

Findings

The major findings of this study are reported in the correlation matrix below. Brief scrutiny of the matrix indicates that all of the correlation coefficients were significantly greater than zero. This finding suggests that all of the variables were interrelated. Further examination reveals that the sociometric variables are strongly interrelated with each other, but not as closely interrelated with the achievement and IQ variables. Moreover, the IQ and the achievement variables are strongly intercorrelated.

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Place Table 1 approximately here

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To summarize the data in the correlation matrix and to answer a more basic question; namely, which variables contribute

significantly to arithmetic prediction; the data in Table 2 was computed. Table 2, therefore, contains a summary of a multiple regression analysis of the individual pupil scores on each variable. As shown in Table 2 the IQ scores accounted for 51 per cent of the variance in the equation. Analysis of the remaining components of variance showed that only pretest arithmetic achievement contributed significantly to the equation. This contribution accounted for six per cent of the variance. All of the sociometric variables combined accounted for less than one per cent of the total variance in the equation.

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Place Table 2 approximately here

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Since there was a relatively high intercorrelation among status variables, and among achievement variables in the correlation matrix, a principal components factor analysis was conducted to determine variable loading on these factors and to determine if other undetected factors were present. The results of the principal components factor analysis are presented in Table 3.

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Place Table 3 approximately here

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Visual inspection of the data in Table 3 indicates that the status variables are better explained than are the achievement variables. This may be a result of the larger number of sociometric variables in the equation.

A geometric interpretation of the relationship within and between the two factors is presented in Figure 1.

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Place Figure 1 approximately here

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This representation gives a clear indication of the factor components and the separation between the two clusters.

The relationship between mathematical findings and behavioral reality are of major importance in interpreting this configuration.

One interpretation which may be drawn is that "status" and "achievement" share a certain communality of interrelationships, but when one wishes to predict either, the unique components are significantly clustered within each factor.

A further analysis of the prediction equation for each classification group was conducted. The technique for testing significance of differences among coefficients of correlation suggested by Edwards (pp 83-85; 1965) was used in analysis of the coefficients of multiple correlation. The results of this analysis indicated that the multiple coefficients of correlation were not significantly different across communities.

This finding implies that even though achievement levels and ability levels vary significantly across communities, the prediction of achievement is very similar with the major components of the prediction equation in the communities being IQ and prior learning. Sociometric factors were not significant components in any of the separate equations computed for communities.

Conclusions

The major conclusions of this study may be stated in the order of the original questions raised.

1. Achievement is positively correlated with status within the classroom when one looks at zero order correlations alone. However, when clusters of correlation coefficients were examined through factor analysis, two separate factors emerged. "Achievement" had shown components of IQ and pretest achievement and posttest achievement. "Status" was composed of self esteem, peer esteem and teacher esteem for pupils. The independence of these factors does not support the self-fulfilling prophecy principle. Rather, it suggests that "achievement" could be treated as a separate construct independent of "status."

2. As a predictor of achievement IQ was more accurate than pretest achievement.

3. Sociometric status variables did not significantly improve the accuracy of achievement prediction when IQ and Achievement pretests were in the equation.

4. There were no significant differences among center city, suburban, farm and non-farm communities with respect to prediction of achievement using the variables in this study.

TABLE 1

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN ALL VARIABLES AS MEASURED IN SEPTEMBER AND FEBRUARY FOR TOTAL SAMPLE (N = 501)*

	Variables	1	2	3	4	5	6	7	8	9
1.	I. Q.	1.00	.67	.31	.39	.34	.71	.29	.38	.37
2.	Arithmetic (September)	.67	1.00	.27	.42	.33	.67	.34	.44	.35
3.	Self Esteem (September)	.31	.27	1.00	.44	.46	.28	.57	.44	.50
4.	Peer Esteem (September)	.39	.42	.44	1.00	.67	.40	.47	.83	.69
5.	Teacher Esteem (September)	.34	.33	.46	.67	1.00	.30	.49	.68	.73
6.	Arithmetic (February)	.71	.67	.28	.40	.30	1.00	.31	.41	.35
7.	Self Esteem (February)	.29	.34	.57	.47	.49	.31	1.00	.53	.57
8.	Peer Esteem (February)	.38	.44	.44	.83	.68	.41	.53	1.00	.75
9.	Teacher Esteem (February)	.37	.35	.50	.69	.73	.35	.57	.75	1.00

*$p < .005$

TABLE 2

MULTIPLE CORRELATION COMPONENTS OF VARIANCE
USING ARITHMETIC ACHIEVEMENT IN FEBRUARY
AS A CRITERION FOR TOTAL SAMPLE
N = 501

Multiple Correlation Coefficient	Intercept (A Value)	Predictor Variables	Regression Coefficients	Cumulative Proportion of Variance
.7655*	-4.83379	(1) I.Q.	.35888	.51071
		(2) Arith. 1	.36867	.06761
		(3) Self 1	.91226	.00183
		(4) Peer 1	2.27140	.00365
		(5) Teacher 1	-2.27320	.00063
		(6) Self 2	1.02857	.00046
		(7) Peer 2	2.33644	.00106
		(8) Teacher 2	.70938	.00010
				.58605**

*$p < .005$

**Coefficient of Determination

The prediction equation for posttest arithmetic achievement (Y) using information in Table LXVIII would be as follows:

$$Y = .36(1) + .37(2) = .91(3) + 2.27(4) - 2.27(5) + 1.03(7) + 2.34(8) + .71(9) - 4.83779$$

TABLE 3

PRINCIPAL-FACTOR SOLUTION FOR NINE VARIABLES
INTERCORRELATED FOR TOTAL SAMPLE USING
COMMUNALITIES FOR DIAGONAL
COMPONENTS

Variable	COMMON FACTORS		Communality
	Status	Achievement	
I. Q.	.22997	.79030	.67746
Arithmetic (September)	.25742	.74603	.62282
Self Esteem (September)	.56500	.19996	.35921
Peer Esteem (September)	.78991	.27837	.70145
Teacher Esteem (September)	.77096	.18071	.62703
Arithmetic (February)	.22397	.78398	.66479
Self Esteem (February)	.61983	.22043	.43278
Peer Esteem (February)	.82973	.27513	.76415
Teacher Esteem (February)	.82783	.20717	.72823
Eigenvalue Contribution of Factor	4.4872	1.0907	5.5779
Percent of Original Communality	49.858	12.119	61.977

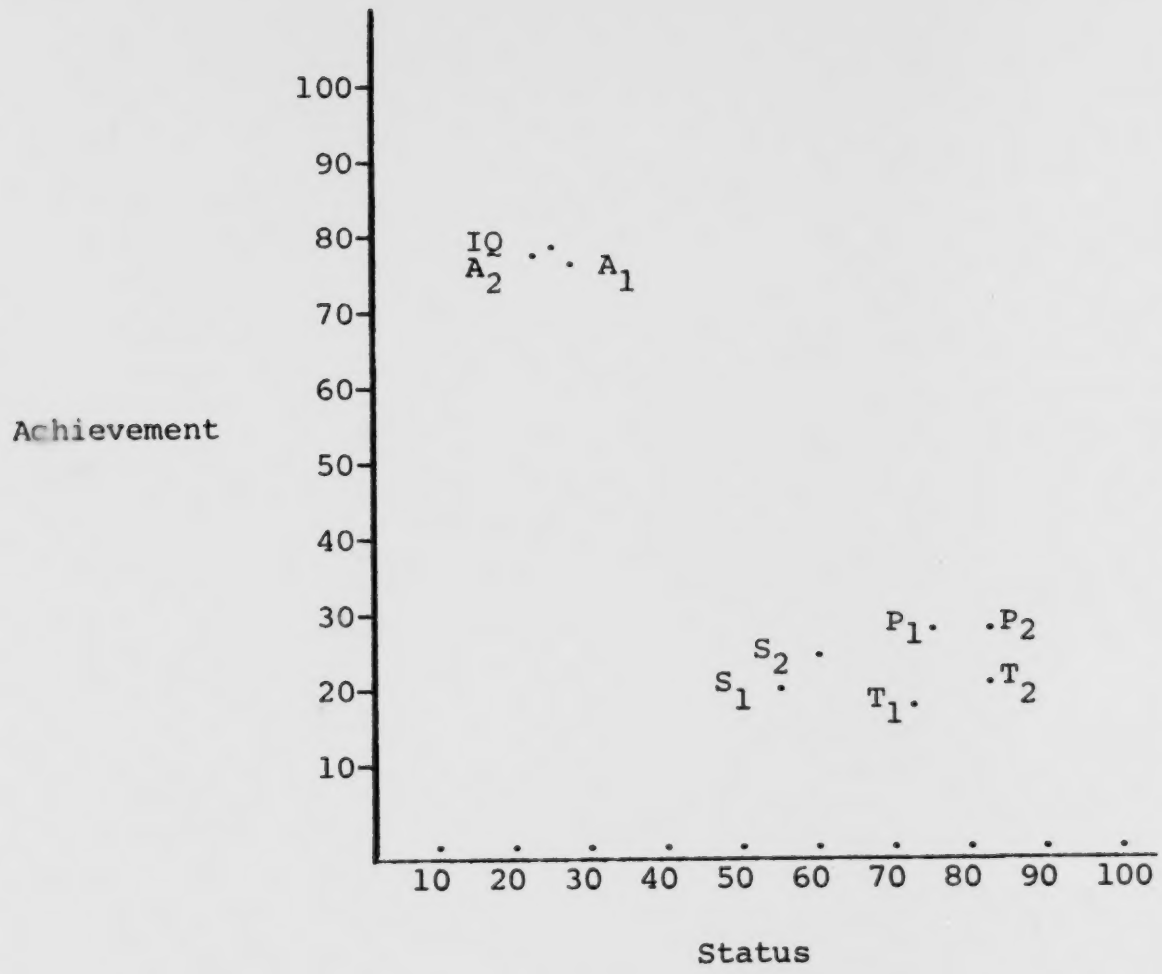

FIGURE 1

A GEOMETRIC REPRESENTATION OF TWO PRINCIPAL FACTORS
IDENTIFIED BY PRINCIPAL COMPONENTS ANALYSIS

References

Brandt, R. M. "The Accuracy of Self Estimates: A Measure of Self Concept Reality," Genetic Psychology Monographs, LVIII (1958), pp. 55-99.

Caputo, Daniel V., George Psathas and John M. Plapp. "Sociometric Factors Related to Subsequent Success in a Nursing Program," Educational and Psychological Measurement, XXVIII (1967). pp. 463-77.

Cartwright, Dorwin and Alvin Zander. Group Dynamics: Research and Theory. New York: Harper and Row, 1960.

Chansky, Norman A. Attributes of Youth in Six Communities. Raleigh, North Carolina: Center for Research, Development and Training in Occupational Education, North Carolina State University, 1966.

Coleman, James S., et al. Equality of Educational Opportunity. Washington, D.C.: United States Department of Health, Education and Welfare, Office of Education, 1966.

Coopersmith, Stanley. "A Method for Determining Types of Self Esteem," Journal of Abnormal and Social Psychology, LIX, No. 1, (1959), pp. 87-94.

Coopersmith, Stanley. "Studies in Self Esteem," Scientific American, CCXVIII, No. 2, (1968), pp. 96-107.

Edwards, Alan L. Experimental Design in Psychological Research.

Gutherie, James W., Douglas A. Penfield and David N. Evans, "Georgraphic Distribution of Teaching Talent," American Educational Research Journal, VI, No. 4, (1969), pp. 645-659.

Jensen, Arthur R. "How Much Can We Boost IQ and Scholastic Achievement?" Harvard Educational Review, XXXIX, No. 1, (1969), pp. 1-123.

Jensen, Arthur R. "How Much Can We Boost IQ and Scholastic Achievement?" A Discussion by Jerome S. Kagan, et al. Harvard Educational Review, XXXIX, No. 2, (1969), pp. 273-356.

Jensen, Arthur R. "Reducing the Heredity - Environment Uncertainty: A Reply," Harvard Educational Review, XXXIX, (1969), pp. 449-483.

Moreno, J. L. "Foundations of Sociometry, An Introduction," Sociometry, IV, (1941), pp. 15-35.

Peper, John B. A Predictive Study of the Relationship between Status and Achievement in Elementary Units of Urban, Suburban, Rural Farm and Rural Non-Farm School Districts. Philadelphia: An unpublished doctoral dissertation, Temple University, 1969.

Peper, John B. and Norman M. Chansky. "Esteem and Achievement in Arithmetic," The Elementary School Journal, LXX, No. 5, (1970), pp. 284-288.

Rosenthal, Robert and Lenore F. Jacobsen. Pygmalion in the Classroom. New York: Holt, Rinehart and Winston, 1968.

Rosenthal, Robert and Lenore F. Jacobsen. Pygmalion in the Classroom. Reviewed by Robert L. Thorndike. American Educational Research Journal, V, No. 4, (1968), pp. 708-11.

Stagner, Ross. Psychology of Personality. New York: McGraw-Hill Book Company, 1948.